

Chapter 14

Measuring Amount

↳ Mol concept with compounds.

- $1 \text{ mol} = 6.022 \times 10^{23}$ "particles"

- Molar Mass = Mass on periodic table

↳ $14.5 \text{ g Al} = \text{--- mol Al} = \text{--- Atoms Al}$

↳ $14.5 \text{ g Al} \times \frac{1 \text{ mol Al} \leftarrow \text{To Top}}{27 \text{ g Al} \leftarrow \text{From Bottom}}$

↳ 0.537 mols Al

↳ $0.537 \text{ mols Al} \times \frac{6.022 \times 10^{23} \text{ Atoms Al}}{1 \text{ mol Al}}$

↳ 3.23×10^{23} Atoms Al

↳ Mass \leftrightarrow Mol \leftrightarrow Particles (atoms, molecules, formula units)

↳ For elements $\rightarrow 1 \text{ mol} = 6.022 \times 10^{23}$ atoms

↳ For Compounds (covalent) $\rightarrow 1 \text{ mol} = 6.022 \times 10^{23}$ molecules
(ionic) $\rightarrow 1 \text{ mol} = 6.022 \times 10^{23}$ formula units

↳ Molar Mass = Total of each element.

↳ ex: NaCl

$\begin{array}{c} \uparrow \quad \uparrow \\ 23.0 \text{ g} + 35.5 \text{ g} \\ \hline 58.5 \text{ g} \\ \text{M} \end{array}$

$\begin{array}{c} \text{CaSO}_4 \\ \downarrow \quad \downarrow \quad \downarrow \\ 40.1 \quad 32.1 \quad (16 \times 4) \\ \hline 136.2 \text{ g} \\ \text{M} \end{array}$

ex: $17.2 \text{ g NaCl} \times \frac{1 \text{ mol NaCl}}{58.5 \text{ g NaCl}}$
0.294 mol NaCl

ex: $35.5 \text{ mol CaSO}_4 = ? \text{ g CaSO}_4$
 $35.5 \text{ mol CaSO}_4 \times \frac{136.14 \text{ g CaSO}_4}{1 \text{ mol CaSO}_4}$
4832.9 g CaSO}_4

ex: $1.53 \times 10^{24} \text{ molec C}_4\text{H}_{10} = ? \text{ mol C}_4\text{H}_{10}$
 $1.53 \times 10^{24} \text{ molec C}_4\text{H}_{10} \times \frac{1 \text{ mol C}_4\text{H}_{10}}{6.022 \times 10^{23} \text{ molec C}_4\text{H}_{10}}$
2.54 mol C}_4\text{H}_{10}

ex: $12.6 \text{ g CO}_2 = ? \text{ molec CO}_2$
 $12.6 \text{ g CO}_2 \times \frac{1 \text{ mol CO}_2}{44.01 \text{ g CO}_2} = 0.286 \text{ mol CO}_2$
 $0.286 \text{ mol CO}_2 \times \frac{6.022 \times 10^{23} \text{ molec CO}_2}{1 \text{ mol}}$
 1.72×10^{23}

Ca = 40.08

S = 32.06

O₄ = 64

136.14 g

C₄ = 48.04

H₁₀ = 10.08

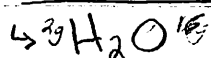
58.12

C = 12.01

O₂ = 32

44.01

% Composition By Mass



↳ %H = 11.1%

Mass of H_2 → $\frac{2\text{g H}}{18\text{g}} = 11.1\%$

Total Mass → 18g

↳ % Comp = $\frac{\text{Total mass of the element in the compound}}{\text{Mass of compound}} \times 100\%$

↳ % O in CaCO_3 $\frac{48\text{g O}}{100.1\text{g}} \times 100\% = 48\% \text{ O}$

↳ % N in $(\text{NH}_4)_3\text{PO}_4$ $\frac{42\text{g N}}{149\text{g}} \times 100\% = 28.18\%$

Law of Definite Composition

↳ All samples of an element or compound will have same chemical make up regardless of source or size of sample.